MOLLUSCA IN THEIR RELATION TO THE GEOLOGICAL HISTORY OF SOAP LAKE, WASHINGTON

BY JUNIUS HENDERSON

It is a matter of general knowledge among scientists that the waters of a completely land-locked lake tend to become saline, for the same reason that the ocean is saline. Streams and springs flowing into a lake carry in solution salts of various kinds and quantities, leached from the soil and rocks through or over which they flow. So long as the amount of water received by the lake exceeds the loss by evaporation, the lake will maintain an outlet at the lowest point in its shore line, the surplus water overflowing and carrying away some of the salts, thus preventing their excessive accumulation. If, because of a change in climatic conditions, the annual evaporation comes to exceed annual accession of water, then the water level drops so that there is no longer any overflow. Consequently all the salts brought in by streams and springs are retained and the water slowly becomes saline. This process sometimes continues until the result is a saturated solution, whereupon precipitation of some of the salts begin to form a deposit on the bottom of the lake. Well-known examples of this phenomenon are the Dead Sea and Great Salt Lake, but there are many others, mostly smaller.

It has long been known that there are many saline lakes of various sizes in the semi-arid Great Basin, between the Rocky Mountains and the coastal ranges in the western United States, and that they have been subjected to great fluctuations in the past and to smaller fluctuations in recent years. Some of them, as for example, Great Salt Lake, in Utah, have at times reached depths permitting overflow, the waters becoming fresh and remaining so long enough for fresh-water fauna to become established, then they have shrunken until they became merely highly-saline remnants of their former extent, all the mollusks being destroyed by the excessive salts, leaving their shells as fossils high above the new water-mark, to tell the story of their former existence and abundance. Thus such shells are often found in the high lake terraces along the borders of Salt Lake Basin. This is also true of many other lakes in Utah, Nevada, eastern California, eastern Oregon and eastern Washington, though but few such lakes have been investigated.

In the summer of 1927, accompanied by Herman Nanney, on an expedition for the University of Colorado, I visited Soap Lake, in Grand Coulee, eastern Washington. There is another lake by the same name in the Okanagan Valley, in the same state. The water of the one we visited is extremely saline. On its shore is a plant established for the purpose of recovering some of the salts for commercial purposes. A few miles north of Soap Lake, in the same valley, is Alkali Lake, also highly saline. No perennial stream occupies the valley in the vicinity of these lakes. No mollusks were found living in either lake and no water was found in the vicinity in which they could live, though a few miles down the valley (north) fresh-water lakes are reported, from one of which (Blue Lake) Dr. Henry A. Pilsbry, in 1903, reported eight species of fresh-water shells.[1]

In passing over the valley floor between Soap and Alkali Lakes we found it thickly strewn in places with fresh-water shells, of the following species: *Valvata humeralis californicus* Pilsbry, *Valvata utahensis* Call, *Pompholyx effusa* Lea, *Planorbis vermicularis* Gould, *Lymnaea* near *traskii* Tryon, and *Pisidium compressum* Prime. These species are all still found living somewhere in the west, showing that the deposit is not older that Quaternary.

Call reported the following as Quaternary fossils at Button's Ranch, Christmas Lakes, Southern Oregon: *Pisidium ultramontanum* Prime, *Lymnaea bulimoides* Lea, *Carinifex*

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[1] THE NAUTILUS, XVII, 84, 1903.

newberryi (Lea), *Planorbis trivolvis* Say and *Planorbis vermicularis* Gould.[2] To these Hannibal added *Lymnaea cubensis* Pfeiffer and *Planorbis dilatatus* Gould, both probably wrong, and *Pompholyx effusa* Lea.[3] Hannibal also reported, in the same paper, the following from the Summer Lake Beds, Quaternary, of Oregon: *Pisidium abditum* Haldeman, *Pisidium pulchella* Jenyns, *Planorbis dilatatus* Gould, *Valvata tricarinata* (Say), *Lanx klamathensis* Hannibal, *Pompholyx effusa* Lea, and *Paludestrina protea* Gould. The first four are almost certainly erroneous. His synonymies are not such as to give one the least bit of confidence in his identifications. The other three are not unlikely. Doubtless a general molluscan survey of the lakes and the adjacent lacustrine deposits of eastern Oregon and Eastern Washington would be of great interest.

VENUS MERCENARIA VAR. NOTATA SAY

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There seems to be considerable confusion between this well-known form of Say's and certain colored forms of *Venus campechiensis* Gmel.

Venus mercenaria notata Say appears usually as a single specimen in a colony populated by *V. mercenaria*. This fact of its thus occurring with the common species precludes any idea of its being either an ecological form or a geographical race. From the evidence at hand, it seems to be a recessive form appearing only as an individual here and there when the dominant factors are eliminated by chance breeding.

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[2] Call, Bulletin U. S. Geological Survey, No. 11, 1884.

[3] Hannibal, Proc. Malac. Soc. London, X, 1912.